

BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 3

MARCH 1956

PART 7

NEW HEADQUARTERS

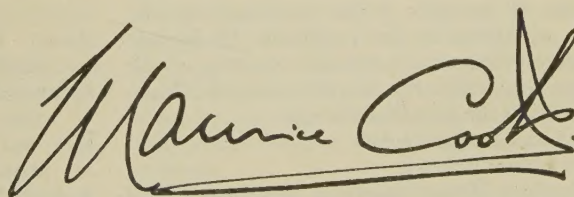
For some time past the Council has been giving consideration to the provision of new headquarters for the Institute because it is clear that, with the continued expansion in membership and activities, it will not be possible, for lack of space, to continue much longer the joint tenancy with The Iron and Steel Institute at 4 Grosvenor Gardens, which is already inadequate and overcrowded.

The two Societies have occupied these premises since 1938, and over the ensuing years the membership of the Institute of Metals has increased from 2221 to more than 4500. It will be appreciated that this notable and gratifying expansion has been accompanied by a much greater proportionate increase in the Institute's many activities and publications. The need for the additional accommodation for current requirements, and to allow further expansion, has become urgent and compelling.

At its last meeting, on 8 February, the Council therefore decided to acquire, on a long-term lease, No. 17 Belgrave Square as new headquarters for the Institute, and it is expected that the transfer will be effected in the near future.

This change will impose on the Institute a substantial financial burden, and although the Council has decided not to make a general appeal to members or to industry, it has authorized the revival of the House Fund, contributions to which will be used towards defraying the expenditure involved in the acquisition of these premises.

Donations to this fund from Industrial concerns and members will be greatly appreciated and duly acknowledged directly and in the Bulletin.

A handwritten signature in dark ink, reading "Maurice Cook". The signature is fluid and cursive, with a long horizontal line extending from the end of the name.

President.

INSTITUTE NEWS

Annual Dinner

The Marquess of Reading (Minister of State at the Foreign Office) has accepted an invitation to be the principal guest at the Annual Dinner of the Institute to be held at Grosvenor House on Wednesday, 11 April.

Autumn Meeting, Germany, Monday to Tuesday, 17-25 September 1956

As previously announced, the 1956 Autumn Meeting will be held in Germany, by kind invitation of the Deutsche Gesellschaft für Metallkunde.

The main part of the meeting will take place in Stuttgart from Monday to Sunday, 17-23 September; on the Sunday members will proceed to Frankfurt, where the meeting will conclude on Monday and Tuesday, 24 and 25 September. For the first two days in Stuttgart, the meeting will be a joint one with the Deutsche Gesellschaft für Metallkunde.

PROVISIONAL PROGRAMME

Saturday, 15 September

Main British parties leave England by air or by reserved sleeper accommodation, via Dover-Ostend.

Sunday, 16 September

Registration of members and guests of both societies at the Technische Hochschule, Stuttgart.

Monday, 17 September

Morn. Joint Opening Session at the Technische Hochschule, Stuttgart. Official welcome by the City of Stuttgart, the Technische Hochschule, and the Deutsche Gesellschaft für Metallkunde.

Presentation of the Heyn Medal of the Deutsche Gesellschaft für Metallkunde.

Discussion of scientific papers published by the Institute of Metals (alternative programme: lecture of the Deutsche Gesellschaft für Metallkunde).

1 p.m. Joint Luncheon at Killesberg.

Aft. Visits for members and ladies (see next column).

6.30 p.m. Reception by the Government of Baden-Württemberg.

8 p.m. Dinner given by the Council of the Deutsche Gesellschaft für Metallkunde for the Council of the Institute of Metals and distinguished foreign delegates.

Tuesday, 18 September

Morn. Discussion of scientific papers published by the Institute of Metals at the Technische Hochschule (alternative programme: scientific meeting of the Deutsche Gesellschaft für Metallkunde at the Max-Planck Institut für Metallforschung).

Aft. Visits for members and ladies.

Evg. Concert (dinner jackets).

Joint Banquet (dinner jackets) at the Kursaal, Bad Cannstadt.

(End of the meeting for the Deutsche Gesellschaft für Metallkunde.)

Wednesday, 19 September

All day. Tours, with visits (see p. 53).

5 p.m. All meet for tea-dance at Freudenstadt.

Thursday, 20 September

Morn. Discussion of scientific papers published by the Institute of Metals.

All day. Visit for ladies to Pforzheim, with lunch.

Aft. Visits for members.

6.30 p.m. Autumn Lecture at the Gustav-Siegle-Haus.

8 p.m. Dinner given by the Council of the Institute of Metals for the Council of the Deutsche Gesellschaft für Metallkunde and distinguished foreign delegates.

Friday, 21 September

All day. Long-distance visits (see p. 53).

Saturday, 22 September

All day. Tour of towns and places of scenic and cultural interest around Stuttgart.

Sunday, 23 September

Morn. Free in Stuttgart.

Aft. Travel to Frankfurt-am-Main (approx. 3 hours).

Monday, 24 September

Morn. Visits (see p. 53); lunch by invitation of host companies.

Evg. Free in Frankfurt.

Tuesday, 25 September

Morn. Visits (see p. 53); lunch by invitation of host companies.

Aft. Meeting ends; main British parties return to England by air or by sleeper train.

VISITS FROM STUTTGART

Monday, 17 September

Allgemeine Elektrizitäts-Gesellschaft, Cannstadt (heavy electrical engineering; transformers; high-voltage laboratory).

Daimler-Benz A.G., Sindelfingen (automobiles and famous car museum).

Maschinenfabrik, Esslingen (steam, diesel, and electric locomotives; rail cars, coaches, and wagons; electric vehicles; compressors; pumps; steel structures; foundry products).

Max-Planck Institut für Metallforschung, Stuttgart (Professor Dr. W. Köster).

M. Streicher, Asperg (iron and steel foundry; boiler works; vehicles).

Tuesday, 18 September

Robert Bosch G.m.b.H., Stuttgart-Feuerbach (electrical automotive accessories).

Fortuna Spezialmaschinenfabrik A.G., Bad Cannstadt (machinery manufacturers).

Mix und Genest, Stuttgart-Zuffenhausen (telephone equipment).

A. Stotz A.G., Kornwestheim (high-grade and alloy cast irons; mechanical handling equipment; machine building).

Staatl. Materialprüfungsanstalt, Cannstadt (Professor Dr. E. Siebel).

Wednesday, 19 September

- Group 1.—Deutsche Gold- und Silberscheideanstalt (Degussa), Pforzheim (precious-metal alloys and solders).
Dr. E. Dürrwächter, Pforzheim (gold-plated articles, contacts, and solders).
Rodi und Wienenberger, A.G., Pforzheim (jewellery).
- Group 2.—Institut Dr. Förster, Reutlingen (non-destructive testing; mainly magnetic, not X-ray).
Württembergische Metallwarenfabrik A.G., Geislingen (fancy metal goods; cutlery; table-ware; glass-blowing).
- Group 3.—Black Forest tour.

Thursday, 20 September

- Group 1.—Carl Zeiss, Heidenheim (optical instruments).
Osram G.m.b.H., Herbrechtingen (electric lamps; tungsten fabrication).
- Group 2.—J. M. Voith G.m.b.H., Heidenheim/Brenz (turbines; propellers; paper-making machinery).
- Group 3.—Württembergische Metallwarenfabrik A.G., Geislingen.
- Group 4.—N.S.U.-Werke A.G., Neckarsulm (motor-bicycles, &c.).
Karl Schmidt G.m.b.H., Neckarsulm (light-metal pistons).

Friday, 21 September

- Group 1.—Telefunken Gesellschaft für drahtlose Telegraphie G.m.b.H., Ulm (radio valves).
Wieland-Werke A.G., Ulm (sheet brass, light metals, and stainless steel; semi-manufactured products).
- Group 2.—Aluminiumwerke Nürnberg G.m.b.H. (Nüral), Nürnberg (aluminium alloy sand-, gravity die-, and pressure die-castings; pistons).
Kabel- und Metallwerke Neumeyer A.G., Nürnberg (cable and metal works).
- Group 3.—AMAG-Hilpert (pumps).
Vereinigte Deutsche Metallwerke A.G., Nürnberg (copper and brass tubes, wire, rivets, screws, and semi-manufactured products; aluminium and aluminium alloy containers).
- Group 4.—Heinrich Diehl G.m.b.H., Nürnberg (non-ferrous casting and forging; semi-manufactured products).
Maschinenfabrik Augsburg-Nürnberg A.G. (M.A.N.), Nürnberg (steam turbines; condensers; impellers; gas- and diesel-engines; cranes, wagons, &c.).
- Group 5.—Visit to Singen.
- Group 6.—Visit to Laucherthal: Castle of Sigmaringen.

VISITS FROM FRANKFURT

Monday, 24 September

- Vereinigte Deutsche Metallwerke A.G., Hedderheimer Kupferwerk, Frankfurt-am-Main.
- W. C. Heraeus G.m.b.H., Hanau-am-Main (high-vacuum shop; apparatus-construction shop; laboratories).
- Schenck, Darmstadt.

Tuesday, 25 September

- Deutsche Gold- und Silberscheideanstalt (Degussa), Hanau-am-Main.
- Süddeutsche Kabelwerke.
- Vacuumschmelze A.G., Hanau-am-Main.

LADIES' VISITS

- Mon., 17 Sept. Tour of Stuttgart.
- Tues., 18 Sept. Württembergische Metallwarenfabrik A.G., Geislingen (fancy metal goods, cutlery, table-ware, glass-blowing), with lunch by invitation.
- Wed., 19 Sept. Black Forest tour (all-day).
- Thurs., 20 Sept. Rodi und Wienenberger, Pforzheim (jewellery).
- Fri., 21 Sept. All-day tour: Nürnberg, &c.
- Sat., 22 Sept. All-day tour of towns and places of scenic and cultural interest around Stuttgart.

TRAVEL AND HOTEL ARRANGEMENTS

Thos. Cook and Son, Ltd., who have been entrusted with the travel and hotel-accommodation arrangements in connection with the meeting, have obtained a large allotment of rooms at hotels of varying grades at Stuttgart and Frankfurt, and have also prepared provisional itineraries for travel by air and surface routes. On the basis of the experience in connection with the meeting in Zürich, it is assumed that the majority of members and ladies will travel by air.

Travelling by air, the main party from the United Kingdom will leave London on Saturday, 15 September, by Swissair service via Zürich, arriving at Stuttgart on the same evening. The journey to Frankfurt will be by first-class rail on Sunday, 23 September, and the return to London will be by direct air service from Frankfurt on Tuesday, 25 September.

For those preferring to travel by surface route, it is proposed that the main party shall leave London at 2.30 p.m. on Saturday, 15 September, by the Tauern Express, with sleeping-car accommodation from Ostend to Stuttgart, arriving on the following morning. The return from Frankfurt on Tuesday, 25 September, will be by afternoon train to the Hook of Holland, with night steamer to Harwich, arriving in London (Liverpool Street) at 9.14 a.m. on Wednesday, 26 September.

Approximate costs with tourist-class air travel will range from £64 10s. to £75 10s. and with the new first-class rail travel (including sleeping-car accommodation, meals en route, &c.) from £54 to £65, according to the grade of hotel and type of room required. The fares do not include transport to visits in Stuttgart (it is understood that this transport will be provided by the firms whose works are visited), but include the transport to works in the Frankfurt area. The hotel arrangements made are on a demi-pension basis.

The Institute of Metals (through Thos. Cook and Son, Ltd.) and the Deutsche Gesellschaft für Metallkunde have reserved practically all the hotel accommodation available both at Stuttgart and Frankfurt. This reserved accommodation must be released, if not definitely booked, two months before the opening of the meeting. To ensure that the required hotel accommodation is reserved, it is *essential* that members shall state their probable requirements at the earliest possible date.

Members are, therefore, requested to advise Thos. Cook and Son, Ltd., Post Order Department, Berkeley Street, London, W.1 (quoting reference POD/5/5900) at the *earliest possible moment* of their probable requirements. This provisional reservation will not commit members in any way, but will greatly facilitate the arrangements being made for the meeting.

When writing to Cooks, members should state: (a) the number of persons who may travel, and whether they hope to travel by air or by rail, (b) date of departure, and (c) class of travel and hotel accommodation that may be required.

Membership

On 31 December 1955, the Institute's membership for the first time exceeded 4500.

The *Journal* printing order is now 6500 copies (300 in bound form); those not required for members are supplied to regular non-member subscribers (individuals and company, public and university libraries).

Since 1945, the Institute's membership has increased by 74·3% and the number of copies of the *Journal* printed each month by 106·3%.

Members are requested to send to the Secretary the names of persons who could appropriately be sent particulars of membership and specimen copies of the Institute's monthly publication.

Overseas Sustaining Membership

Though generous financial support of the Institute's work is given each year by companies in the British metallurgical and engineering industries (for a list of donations, see Appendix II to the last Report of Council), no appeal has heretofore been made by the Council for such support from companies whose headquarters are located outside the United Kingdom.

On the advice of Corresponding Members, the Institute's rules have now been revised to provide for Overseas Sustaining Membership (company memberships), through which companies whose headquarters are outside the United Kingdom may also give financial support to the important work that the Institute does for metallurgical science and industry, and from which they benefit.

An Overseas Sustaining Member pays a minimum annual subscription of £25, and is entitled to nominate two individuals for membership of the Institute, whose subscriptions are covered by the company subscription.

The Council hopes that many Companies will be willing to support the Institute through Overseas Sustaining Membership, particulars and forms of application for which can be obtained from the Secretary.

Election of Members

The following 5 Ordinary Members, 1 Junior Member, and 3 Student Members were elected on 18 January 1956:

As Ordinary Members

- BARNES, Russell Franklin, B.A., M.S., Librarian, James Jerome Hill Reference Library, 4th St. at Market St., St. Paul 2, Minn., U.S.A.
- COLEY, Robert William, Managing Director, R. J. Coley and Son (Hounslow), Ltd., Jubilee Works, Chapel Road, Hounslow, Middx.
- HAKIN, Charles Kenneth, B.Sc., Technical Sales Representative, Henry Wiggin and Co., Ltd., 66 Mosley Street, Manchester 2.
- RICKETTS, Leo Edward, Director, R. J. Coley and Son (Hounslow), Ltd., Jubilee Works, Chapel Road, Hounslow, Middx.
- STEVEN, William, B.Sc., Ph.D., A.R.T.C., F.I.M., Superintendent, Birmingham Laboratory, The Mond Nickel Co., Ltd., Wiggin Street, Birmingham 16.

As Junior Member

- HUCKE, Edward Ernest, Sc.D., Assistant Professor of Metallurgy, Department of Chemical and Metallurgical Engineering, University of Michigan, Ann Arbor, Mich., U.S.A.

As Student Members

- HUKIN, Royden Langton, Undergraduate, Department of Metallurgy, University of Liverpool.
- MARSHALL, John Graham, Junior Technical Assistant, Henry Wiggin and Co., Ltd., Wiggin Street, Birmingham 16.
- SHOWAK, Walter, M.S., Department of Metallurgy, Pennsylvania State College, University Park, Pa., U.S.A.

The following Overseas Sustaining Member, 8 Ordinary Members, 3 Junior Members, and 10 Student Members were elected on 8 February 1956:

Overseas Sustaining Member

- REVERE COPPER AND BRASS INC., Rome, N.Y., U.S.A.

As Ordinary Members

- GODFREY, Alec James, B.Sc., Technical Representative, Imperial Smelting Corporation (Sales), Ltd., 37 Dover Street, London, W.1.
- HALLAS, Edwin, Technical Director, The Brightside Foundry and Engineering Co., Ltd., Sheffield 1.
- HILLS, Ronald Frederick, A.I.M., Metallurgist, Atomic Energy Research Establishment, Harwell, Berks.
- ROSEMAN, Herman, Director, Mitcham Smelters, Ltd., Red House Road, Mitcham Road, Croydon, Surrey.
- SCHWARZSCHILD, (Miss) Helga Henriette, Metro Metal Traders, Ltd., 35/37 Broad Street Avenue, London, E.C.2.
- SIRIWARDENE, Parana Palliya Guruge Lionel, B.Sc., Ph.D., A.R.I.C., Lecturer, University of Ceylon, Colombo, Ceylon.
- UDALL, William, M.I.Mech.E., M.I.Prod.E., Chief Engineer, The Brightside Foundry and Engineering Co., Ltd., Sheffield 1.
- WISE, Samuel Ephraim, Works Manager, Sterling Products, Ltd., Leyborne Avenue, London, W.13.

As Junior Members

- HARRINGTON, Douglas Russell, B.Sc., Metallurgist, The Delta Metal Co., Ltd., East Greenwich, London, S.E.10.
- JAGGER, Frank Leslie, Assistant Experimental Officer, Metallurgy Division, Atomic Energy Research Establishment, Harwell, Berks.
- MURPHY, Douglas, Assistant Technical Officer (Metallurgical), Research Department, Imperial Chemical Industries, Ltd., Metals Division, Witton, Birmingham.

As Student Members

- ANDERSON, Colin, High Duty Alloys, Ltd., Winscales, Workington, Cumberland.
- BALASUNDARAM, Lalgudy Jagadesa, B.Sc., D.I.I.Sc., Student, Department of Metallurgy, University of Sheffield.
- BRAMMAR, Ian Sydney, Undergraduate, Department of Metallurgy, University of Sheffield.
- CHINOY, Mohammed Usman, Undergraduate, Department of Metallurgy, University College, Swansea.
- GRIMWADE, Mark Frederick, B.Sc., Experimental Staff, Research Laboratories, The General Electric Co., Ltd., North Wembley, Middx.
- HARDING, Alan G., Metallurgy Division, Atomic Energy Research Establishment, Harwell, Berks.
- KINGSLEY-JONES, Peter, Undergraduate, Department of Metallurgy, University College, Swansea.
- McKAY, William, Metallurgist, High Duty Alloys, Ltd., Winscales, Workington, Cumberland.

MELLORS, Brian Michael, A.Met., Postgraduate Student, Department of Metallurgy, University of Sheffield.
SLINGSBY, Alan, B.Met., Metallurgist, The Bristol Aeroplane Co., Ltd., Aircraft Division, (Weston Factory), Oldmixon, Weston-super-Mare, Somerset.

Papers and Notes for Publication in the "Journal"

The Council, through the Metallurgical Engineering Committee, wishes to encourage the submission of brief papers or notes, for publication in the *Journal*, describing specially developed items of equipment which have metallurgical or engineering novelty.

Those (members and non-members) who are in a position to offer such papers or notes are requested to communicate with the Secretary when occasion arises.

Members and others who can submit papers for publication on subjects of direct industrial interest are also requested to communicate with the Secretary, giving, if possible, brief synopses of the papers they would be prepared to offer.

Monograph No. 17: "The Control of Quality in the Production of Wrought Non-Ferrous Metals and Alloys. III.—The Control of Quality in Heat-Treatment and Final Operations"

This monograph contains the six papers contributed to the Symposium held at the last Spring Meeting of the Institute, together with the discussion upon them. Copies are now available at the following prices (post free):

Members (one copy only)	7s. 6d. (\$1.50)
Non-members	15s. 0d. (\$2.50)
Libraries	12s. 6d. (\$1.95)

Annotated Equilibrium Diagrams

Four further systems have now been added to the Institute's series of Annotated Equilibrium Diagrams. They are:

- No. 19. The Aluminium-Beryllium System.
- No. 20. The Aluminium-Cobalt System.
- No. 21. The Aluminium-Silver System.
- No. 22. The Aluminium-Titanium System.

All have been prepared by Mr. H. W. L. PHILLIPS, M.A., F.R.I.C., F.Inst.P., F.I.M., of The British Aluminium Co., Ltd.

The diagrams may be obtained from the Institute at the following prices (post free):

Members (one copy only)	1s. 0d. (\$0.40)
Non-members	2s. 0d. (\$0.50)
Libraries	1s. 8d. (\$0.40)

Binding of Volumes

Members who have had their volumes of the *Journal*, *Metallurgical Abstracts*, and *Bulletin* bound (in cases supplied free of charge by the Institute) by Mr. W. A. Newark, 2 Clerkenwell Green, London, E.C.1, are requested to note that, because of recent increases in wages and of postage, the charges for binding the 4th volumes have had to be revised as follows:

	Per Vol., Post Free
Journal	12s. 6d.
Metallurgical Abstracts	12s. 6d.
Bulletin	11s. 6d.

As the *Bulletin* volumes are bound only every two years at present, no case was supplied for the year 1953-54; those who wish to bind their copies of the *Bulletin* should therefore ensure that the *Bulletin* pages are preserved for binding in a case to be supplied with the volumes for 1954-55.

PERSONAL NOTES

MR. J. G. BALL, head of reactor metallurgy in the Metallurgy Division of the Atomic Energy Research Establishment, Harwell, has been appointed to a new Chair of Physical Metallurgy at the Imperial College of Science and Technology, London.

MR. U. G. BHAT has been awarded the Ph.D. degree of Lehigh University and has joined the Research and Development Laboratories of the Crucible Steel Co. of America, Pittsburgh, Pa.

MR. J. C. BLADE has left the Tin Research Institute and is now with Aluminium Laboratories Limited, Banbury.

MR. W. H. BOWMAN has been appointed to the Board of the Aluminium Wire and Cable Co., Ltd., Swansea.

MR. R. BULLOUGH has been appointed a Research Scientist in the A.E.I. Research Laboratory, Aldermaston, Berks.

MR. R. D. CARTER has been awarded a Sir Alexander Roger Travelling Scholarship by British Insulated Callender's Cables, Ltd., and is to spend six months studying the extraction and fabrication of copper in Canada and the United States.

MR. F. A. A. CRANE has taken up an appointment in the Research Laboratories of The British Aluminium Co., Ltd., Gerrard's Cross, Bucks.

MR. S. F. DERBYSHIRE has retired from his position as General Production Manager of The British Aluminium Co., Ltd., but remains in a consultative capacity to the Company for the time being.

DR. W. M. DOYLE has been appointed Manager of the Research Division of High Duty Alloys, Ltd., Slough. He retains the function and title of Chief Research Metallurgist.

MR. N. F. EATON has obtained the degree of Ph.D. of the University of Wales and has now joined the Research Department of Metropolitan-Vickers Electrical Co., Ltd., Manchester.

DR. J. E. GARSIDE, formerly Head of the Department of Applied Chemistry, Northampton Polytechnic, London, has been appointed Head of Borough Polytechnic, London.

MR. E. GREGORY has left the Manganese Bronze and Brass Co., Ltd., Ipswich, to take up an appointment with the Sintercast Corp. of America, Yonkers, N.Y.

MR. WILLIAM S. GUMMER has been elected President of the Port Kembla Branch of the Australian Institute of Metals for 1956.

DR. W. C. HAGEL has left the Carnegie Institute of Technology, Pittsburgh, and has taken up a post in the Large Steam Turbine Department of The General Electric Co., Schenectady, N.Y.

PROFESSOR DR. MAX HANSEN, Metallgesellschaft A.G., Frankfurt/Main, has been elected President of the Deutsche Gesellschaft für Metallkunde for the three-year period 1956-58.

MR. C. C. HANSON has been appointed Chief Metallurgist of Radiation, Ltd.

MR. F. HOWITT has been appointed Foundry Manager to Leopold Lazarus, Ltd., Birmingham.

DR. SAMUEL L. HOYT, Metallurgical Consultant of Columbus, Ohio, is visiting Britain and the Continent during March to investigate new developments for possible use in the United States.

MR. D. JAMES has been appointed Development Manager to T.I. Aluminium, Ltd., Birmingham.

MR. H. W. KEEBLE has been elected a director of K. and L. Steelfounders and Engineers, Ltd., Letchworth.

MR. G. L. MORETON has been appointed Superintendent of the Heat-Treatment Service, West Midlands Gas Board, Birmingham.

MR. D. P. C. NEAVE, Vice-Chairman of the Consolidated Zinc Corporation, Ltd., has been elected Chairman of the Zinc Development Association.

DR. J. D. NODEN has left The Mond Nickel Co., Ltd., to join the Atomic Energy Department of The General Electric Co., Ltd., Erith, Kent.

THE HON. R. M. PRESTON has received a presentation from the Members of Council of the British Non-Ferrous Metals Research Association to mark their appreciation of his services as Chairman of the Council for five years and previously as Deputy Chairman and Honorary Treasurer.

MR. A. PRINCE has resigned his lecturership in metallurgy at the University of Southampton to take up an appointment in the Atomic Energy Division of The General Electric Co., Ltd., Erith.

MR. E. G. RAMACHANDRAN Department of Metallurgy, Indian Institute of Science, Bangalore, has been awarded the Kamani Gold Medal for 1955 by the Indian Institute of Metals for the best paper published in its *Transactions*.

MR. S. RAMAMURTHY has been awarded the degree of Ph.D. in Metallurgy of the Banaras Hindu University.

MR. J. SALTER has been appointed Joint General Production Manager of The British Aluminium Co., Ltd.

DR. SHENG-TAI SHIH has been appointed Assistant Professor of Metallurgy, Montana School of Mines, Butte, Mont.

MR. J. THEXTON has been appointed Chief Metallurgist of Henry Wiggin and Co., Ltd.

MR. R. THORLEY has left Aluminium Laboratories, Ltd., to take a post in the Research and Development Division of High Duty Alloys, Ltd., Slough.

MR. R. T. F. WATERS has left The English Electric Co., Ltd., to take up a post as metallurgist with Standard Telephones and Cables, Ltd., Rectifier Division, Harlow, Essex.

MR. K. J. B. WOLFE has been appointed head of fundamental research by the Triplex Safety Glass Co., Ltd., and will take charge of the Company's new research department which is to be built at Willesden.

Deaths

The Editor regrets to announce the deaths of:

MR. W. J. FELTON, O.B.E., Secretary of The Institution of Mining and Metallurgy, on 10 February 1956. The Institute was represented at the funeral by Mr. W. A. C. Newman, C.B.E.; the Secretary was unavoidably unable to attend.

MR. JOHN CLIFFORD JONES on 25 December 1955, aged 51. He was Vice-President of Aluminium Transatlantic, Inc., and President of Magnesium Elektron, Ltd.

OBITUARY

Mr. S. E. Flack

Mr. Sidney Eric Flack died after a short illness on 1 January 1956, a week before his 81st birthday.

After being educated at Camden Town School and London Polytechnic, Mr. Flack began his career with the London Branch of the Phosphor Bronze Co., Ltd. In 1898 he joined his brother-in-law, the late Mr. J. C. Bull, when the latter formed Bull's Metal and Melloid Co., Ltd., Glasgow. He served this company successively as Secretary, General Manager, Managing Director, and Chairman until his retirement in 1944.

Mr. Flack was for many years active in the affairs of the North West Engineering Trades Employers' Association (now known as the Scottish Engineering Employers' Association). He was a member of its Brassfounding Committee from 1926 to 1947 (Chairman 1930-47), a member of its Executive Committee from 1930 to 1947, and representative of the Association on the Scottish Founding Committee 1930-47.

He became a member of the Institute of Metals in 1915 and was an active member of the Scottish Local Section from its inception, serving as Chairman in 1926-29.

H. BULL.

NEWS OF LOCAL SECTIONS AND ASSOCIATED SOCIETIES

Birmingham Local Section

Christmas Lecture

The Christmas Lecture, organized annually by the Birmingham Local Section, was last year entitled "Metals in an Atomic Age" and was delivered on the afternoon of 19 December 1955, by Dr. H. M. FINNISTON of the Atomic Energy Research Establishment, Harwell. Presented in the lecture theatre of the Physics Department at Birmingham University, under the chairmanship of Mr. S. S. SMITH, the lecture attracted an audience of 300 children from the senior forms of the local grammar and similar schools.

Dr. Finniston began by describing the build-up of atoms into crystal lattices and, referring in passing to "whisker growths", demonstrated some properties of single crystals. He pointed out that by the possession of certain properties some elements were classed as metals, and proceeded to discuss and demonstrate the wide variations in these properties which might be encountered. Members of the audience were able to examine samples of many uncommon metals, and in several instances could prove for themselves the unusual nature of these metals.

Some of the methods which had to be developed to produce rare metals were described, particular emphasis being placed on powder-compacting techniques using hydrostatic pressure. The use of these techniques to produce articles of commerce was mentioned, an example being porous bearings impregnated with organic material to give low frictional losses.

Techniques used in the generation of power from atomic sources were outlined, including the use of liquid metals for cooling, and before concluding the lecturer handed round a plastic-enclosed sample of metal similar to that used in the *Nautilus*.

JOINT ACTIVITIES

London Local Section

At a meeting of the Section held at 4 Grosvenor Gardens, S.W.1, on 5 January 1956, Dr. D. McLEAN (Metallurgy Division, National Physical Laboratory) gave a lecture on:

Grain Boundaries

The first part of the lecture was concerned with the sliding of one crystal over another that takes place at crystal boundaries when a metal is stressed at elevated temperature. It was suggested that the main problem was to explain the interaction between grain deformation and grain-boundary sliding. A review of recent experimental evidence led to two main conclusions: (a) that when the stress is kept constant, the activation energy for sliding at grain boundaries is the same as that for grain deformation, and (b) that during a creep test the ratio $\frac{\text{distance of sliding}}{\text{elongation}}$ remains constant. These

results suggest that both sliding and grain deformation are controlled by the same atomic process, and some evidence indicates that this controlling process is contained in the crystallographic slip that causes grain deformation. An explanation of the interaction between grain deformation and grain-boundary sliding consistent with this was proposed.

In the second part, Dr. McLean discussed intergranular cracking during creep. Two kinds of incipient cavity were distinguished, namely, the spearhead crack based on a grain corner and caused by the stress concentration set up by the sliding boundary in the way that Zener and Eborall have suggested, and the rounded cavities distributed more or less randomly along grain boundaries in the manner first clearly recognized by Greenwood. Micrographs were shown to illustrate a proposal that the condition determining which kind of cavity formed was the stress, a high stress favouring the first type. Finally, reasons were given for believing that the most important property governing intergranular brittleness was the energy of the new surfaces created when a cavity was formed, and that this depended on impurity and alloy content.

South Wales Local Section

At a meeting of the Section held at University College, Swansea, on 6 December 1955, Dr. J. WHITE gave a lecture on:

Refractories and Fluxes

Dr. White said that chemical attack by fluxes, slags, &c., was the main cause of failure of refractories used in exposed positions. Resistance to such attack depended not only on the physical and chemical properties of the brick and the slag, but also on many highly specific factors relating to the operation of the particular furnace, including the rate of supply of active flux, the degree of erosion, and the temperature gradient through the refractory. It was therefore difficult, if not impossible, to measure the durability of refractories quantitatively by any standardized laboratory test, simulative or otherwise, and this accounted for the use of trial panels, &c., by refractories technologists who were asked to specify for new applications.

The main chemical factors that influenced durability were: (1) the rate at which the reaction proceeded when the slag and refractory were in contact, and (2) the quantity of refractory which the slag could dissolve at the operating temperature before it reached saturation. Recent work had shown that, while the initial reaction at the slag/refractory interface was fairly rapid, once a saturated layer had been formed, the rate of attack under static conditions was controlled by diffusion through this layer. The importance of the second factor was

illustrated by the effects of alumina and alkalis on the durability of silica bricks in service. Liquid immiscibility occurred in such systems as CaO-SiO_2 , FeO-SiO_2 , and MnO-SiO_2 , and because of this the solubility of silica in such slags was restricted up to the temperature at which melting to give two liquid phases took place. A few per cent. of alumina or alkalis, however, was sufficient to produce complete miscibility and caused a marked reduction in durability.

In practice, the mechanism of attack was complicated by the fact that the fluxes were drawn into the pores of the brick by capillary suction to a depth determined by the temperature gradient through the brick and the freezing point of the lowest-melting eutectic formed by the silica-saturated slag. This resulted in the formation of zones of different chemical composition and in the concentration of low-melting liquid behind the hot face. To minimize this, bricks of low porosity were desirable.

In the case of basic refractories, the nature of the matrix and of the reaction products, when slagging occurred, was determined largely by the molar ratio of $\text{CaO} : \text{SiO}_2$. When this was greater than two, Fe_2O_3 , Al_2O_3 , and Cr_2O_3 occurred as CaO compounds which were generally of rather low melting point. When it was less than two, these oxides occurred in combination with MgO and FeO as high-melting-point spinels. Another complication arose from the fact that iron oxides formed solid solutions with the MgO and chrome spinels of the refractory. In the latter case the process of solution was accompanied by large expansions which might cause the brick to disintegrate. Changes in the state of oxidation of the iron oxide due to changes in temperature or due to changes in the oxygen pressure of the atmosphere could also cause friability and failure in certain applications. One cure for this in forsterite and magnesite-chrome bricks, which had been patented in America, was the addition of finely divided alumina. This apparently acted by stabilizing the iron oxide against changes of temperature and atmosphere.

JOINT ACTIVITIES

Copper Pass Awards

The Adjudicating Committee, representing the Councils of the Institution of Mining and Metallurgy and of the Institute of Metals, have made the following Copper Pass Awards in respect of papers published in the *Transactions* of the Institution of Mining and Metallurgy and the *Journal* of the Institute of Metals for the years 1954 and 1955.

Awards for the Year 1954

£100 to Mr. G. Lawrie Fairs for a paper on "A Method of Predicting the Performance of Commercial Mills in the Fine Grinding of Brittle Materials" (*Trans. Inst. Min. Met.*, 1954, 63, pp. 211-240).

£100 to Mr. F. King and Dr. A. N. Turner for a paper on "The Control of Quality in the Hot and Cold Rolling of Aluminium and Aluminium Alloys" (*J. Inst. Metals*, 1953-54, 82, pp. 291-306).

£50 to Mr. G. L. Hopkin, Mrs. J. E. Jones, Mr. A. R. Moss, and Mr. D. O. Pickman for a paper on "The Arc Melting of Metals and Its Application to the Casting of Molybdenum" (*J. Inst. Metals*, 1953-54, 82, pp. 361-373).

£50 to Professor M. Rey for a paper on "Flotation of Oxidized Ores of Lead, Copper, and Zinc" (*Trans. Inst. Min. Met.*, 1954, 63, pp. 541-548).

Awards for the Year 1955

£100 to Dr. Maurice Cook, Mr. C. L. M. Cowley, and Mr. E. R. Broadfield for a paper on "The Use of Refractories in Low-Frequency Induction Furnaces for Melting Copper Alloys" (*J. Inst. Metals*, 1954-55, 83, pp. 295-305).

£100 to Mr. P. M. J. Gray for a paper on "The Extraction of Uranium from a Pyritic Ore by Acid Pressure Leaching" (*Trans. Inst. Min. Met.*, 1955, 65, pp. 55-64).

£50 to Mr. W. T. Edmunds and Mr. R. C. Lloyd for a paper on "The Production of Light-Alloy Drop-Forgings, Their Heat-Treatment, Inspection, and Testing" (*J. Inst. Metals*, 1954-55, 83, pp. 247-261).

The Capper Pass Awards are made from a fund placed at the disposal of the Councils of the two Societies by the Directors of Capper Pass and Son, Ltd., for the encouragement of the publication of scientific and technical papers dealing with processes and plant used in extraction metallurgy and on the subject of assaying and of papers and processes used in all branches of the non-ferrous metal industry.

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee invites applications for the award of Mond Nickel Fellowships for the year 1956. Awards will be made to selected applicants of British nationality educated to University degree or similar standard, though not necessarily qualified in metallurgy, who wish to undergo a programme of training in industrial establishments; they will normally take the form of travelling Fellowships—awards for training at Universities will be made only in exceptional circumstances. There are no age limits, though awards will seldom be given to persons over 35 years of age. Each Fellowship will occupy one full working year. The Committee hope to award up to five Fellowships each year, of an approximate value of £900 to £1200 each.

Mond Nickel Fellowships will be awarded in furtherance of the following objects:

(a) To allow selected persons to pursue such training as will make them better capable of applying the results of research to the problems and processes of the British metallurgical and metal-using industries.

(b) To increase the number of persons who, if they are subsequently employed in executive and administrative positions in the British metallurgical and metal-using industries, will be competent to appreciate the technological significance of research and its results.

(c) To assist persons with qualifications in metallurgy to obtain additional training helpful in enabling them ultimately to assume executive and administrative positions in British metallurgical and metal-using industries.

(d) To provide training facilities whereby persons qualified in sciences other than metallurgy may be attracted into the metallurgical field and may help to alleviate the shortage of qualified metallurgists available to industry.

Applicants will be required to state the programme of training in respect of which they are applying for an award, as well as particulars of their education, qualifications, and previous career. Full particulars and form of application can be obtained from: The Secretary, Mond Nickel Fellowships Committee, 4 Grosvenor Gardens, London, S.W.1. Completed application forms will be required to reach the Secretary of the Committee not later than 1 June 1956.

OTHER NEWS

International Mechanical Engineering Congress

The Sixth International Mechanical Engineering Congress will be held in Paris on 4-9 June 1956. The theme of the Congress will be "Surface Treatment for the Improvement of Mechanical Properties and for Protection Against Corrosion". The work of the Congress will be divided into eight sections: (1) Improvement of resistance to wear by increase of surface hardness; (2) improvement of resistance to wear through improvement of friction characteristics; (3) improvement of resistance to heat; (4) improvement of resistance to corrosion by metal coatings deposited by means other than electroplating; (5) improvement of resistance to corrosion by electroplating processes; (6) improvement of resistance to corrosion by non-metallic coatings; (7) improvement of resistance to corrosion by chemical processes; and (8) surface treatment for decoration and for improving optical properties.

Full details may be obtained from the Permanent Secretariat of the Congress, 11 Avenue Hoche, Paris (8e) or from The British Engineers' Association, 32 Victoria St., London, S.W.1.

Physical Society's Exhibition of Scientific Instruments and Apparatus

The 40th Exhibition of the Physical Society will be held at the Royal Horticultural Society's Old and New Halls, Westminster, London, S.W.1 (just behind Victoria Street from Artillery Row) from Monday to Thursday, 14-17 May 1956.

Special free admission tickets are kindly offered by the Society to members of the Institute of Metals; application for these tickets (stating the day for which they are required) should be made to the Secretary of the Institute as early as possible. This year, tickets may be obtained for the morning of the opening day, when the Exhibition is not so crowded.

The "Handbook of Scientific Instruments and Apparatus, 1956", published in connection with the exhibition, is now on sale (price 7s. 6d., post free) from the Society at 1 Lowther Gardens, Prince Consort Road, London, S.W.7.

Physical Chemistry in Pyro-Metallurgy

A Summer School in the physical chemistry of systems of metallurgical interest at high temperatures will be held by the Nuffield Research Group in Extraction Metallurgy from 2.00 p.m. on 10 September to noon on 14 September 1956 in the Department of Metallurgy, Imperial College, London, S.W.7.

The course will consist of lectures on the following topics, supplemented by discussions, demonstrations, and experiments: (1) Introduction to thermodynamic concepts of major importance from a metallurgical standpoint. (2) Free-energy diagrams for systems involving pure phases and solutions. (3) Kinetics in high-temperature solids and liquids. (4) Molten metals and alloys. (5) Molten salts and slags, especially silicates. (6) Volatile metal compounds. (7) Techniques for laboratory investigations at 1000°-2000° C. (8) Research materials and temperature measurement and control.

The fees for the course are £10 10s., reduced to £5 5s. for present registered students of Universities. The number attending will be limited, and applications should be made as soon as possible. Full details are obtainable from the Nuffield Research Group at the address given above.

Structural Aluminium Research Scholarship

The Institution of Structural Engineers accepted, in 1954, an offer by the Aluminium Development Association of a Research Scholarship to the value of £400 a year to enable the holder to undertake research on some aspect of the application of aluminium alloys to structures. The Scholarship is awarded in alternate years for a two-year period, and the first holder is nearing the end of his tenure of the Scholarship. It is the intention of the Institution to make the next Award of this Scholarship in 1956, with a view to the successful applicant commencing his investigations at the beginning of the University Session in October next. Entries for the Scholarship to be awarded this year close on 31 March. The Scholarship is administered by the Institution, and further particulars, together with forms of entry, should be obtained from the Secretary of the Institution of Structural Engineers, 11 Upper Belgrave Street, London, S.W.1.

Association of Dutch Galvanizers

Last November a new Association of Dutch Galvanizers was formed with the title: Vereniging van Nederlandse Verzinkerijen. Its main aims and objects are the advancing of scientific and technical knowledge of hot-dip galvanizing, promoting applications of the process, and maintaining contact with similar organizations in other European countries. The first chairman of the Association is Mr. Ch. van Kempen, Director of Verzinkerij Johan Vis & Co. N.V., Amsterdam, and a member of the Institute of Metals.

DIARY

The Institute

- 10 April. May Lecture: "Ferroelectrics—the Dielectric Analogue of Ferromagnetism", by Dr. Willis Jackson. (Royal Institution, Albemarle Street, W.1, at 7.0 p.m.)
- 11–13 April. Annual Spring Meeting. (For details, see February *Bulletin*, pp. 43–44.)
- 25 April. "The Beginnings of Metallography", by Professor Cyril Stanley Smith. (4 Grosvenor Gardens, London, S.W.1, at 6.45 p.m.)

Local Sections and Associated Societies

- 20 March. **Birmingham Local Section.** "Soldering and Brazing Metallurgical Materials", by R. C. Jewell. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)
- 20 March. **North East Metallurgical Society.** "Powder Metallurgy", by Dr. Ivor Jenkins. (Cleveland Scientific and Technical Institution, Middlesbrough, at 7.15 p.m.)
- 20 March. **South Wales Local Section.** Annual General Meeting, followed by films. (Department of Metallurgy, University College, Singleton Park, Swansea, at 6.45 p.m.)
- 3 April. **Oxford Local Section.** Annual General Meeting, followed by "Nuclear Power", by Dr. H. M. Finnieston. (Ballroom of the Cadena Café, Cornmarket Street, Oxford, at 7.0 p.m.)
- 5 April. **Birmingham Local Section.** Annual General Meeting and Chairman's Address. (Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham, at 6.30 p.m.)

- 5 April. **Leeds Metallurgical Society.** "Trends in Metallurgy", by Professor A. G. Quarrell. (Large Chemistry Lecture Theatre, The University, Leeds 2, at 7.15 p.m.)
- 5 April. **London Local Section.** Annual General Meeting, followed by a discussion on "The Properties and Uses of Titanium and Its Alloys". (4 Grosvenor Gardens, London, S.W.1, at 6.0 p.m.)
- 10 April. **Scottish Local Section.** Visit to the works of Begg, Cousland and Co., Ltd., Springfield Wire Works, Glasgow.
- 12 April. **Liverpool Metallurgical Society.** "Non-Destructive Testing", by Dr. R. F. Hanstock, followed by the Annual General Meeting. (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.0 p.m.)

Other Societies

- 20 March. **Institute of British Foundrymen, East Anglian Section.** "Propeller Manufacture", by J. M. Langham. (Central Hall, Public Library, Ipswich, at 7.30 p.m.)
- 20 March. **Institute of British Foundrymen, Slough Section.** Annual General Meeting, followed by "Precision Casting", by G. Tomkinson. (Lecture Theatre, High Duty Alloys, Ltd., Slough, at 7.30 p.m.)
- 21 March. **Institute of British Foundrymen, London Branch.** "Theory and Practice in Steel Castings Production", by J. F. B. Jackson. (Waldorf Hotel, London, W.C.2, at 7.30 p.m.)
- 22 March. **Institute of British Foundrymen, Southampton Section.** "Fundamentals in the Casting of Non-Ferrous Metals", by E. C. Mantle. (Technical College, St. Mary's Street, Southampton, at 7.30 p.m.)
- 23 March. **Manchester Association of Engineers.** Annual General Meeting, followed by "The Production of Steel Strip and Sheets", by H. Edwards. (Engineer's Club, Albert Square, Manchester 2, at 6.45 p.m.)
- 11 April. **North East Coast Institution of Engineers and Shipbuilders, Student Section.** "Aluminium in Shipbuilding", by J. Fulcher. (Bolbec Hall, Newcastle-upon-Tyne, at 6.45 p.m.)
- 11–12 April. **Society of Chemical Industry, Corrosion Group.** Symposium on Prevention of Corrosion in Packaging and Storage. "Principles of Control of Atmospheric Corrosion", by E. L. Evans and E. G. Stroud; "Practical Methods of Preventing Corrosion in Packages", by J. Ferriggi; "The Selection of the Packaging Method", by F. A. Paine; "Testing Packaging Materials", by R. B. Turnbull; "Packaging Service Equipment", by E. L. Hill and D. J. Evans; "Some Industrial Problems in Packaging and Storage", by J. F. Kayser. (The University, Edgbaston, Birmingham 15; on 11 April at 2.30 p.m., and 12 April at 9.30 a.m.)
- 13 April. **West of Scotland Iron and Steel Institute.** "Thermal and Chemical Behaviour in the Open-Hearth Furnace", by Dr. P. T. Carter, W. G. Cameron, and Professor R. Hay. (39 Elmbank Crescent, Glasgow C.2, at 6.45 p.m.)
- 16 April. **East Midlands Metallurgical Society.** Annual General Meeting, followed by "Some Developments in the Electrodeposition of Metals and Alloys", by Professor J. W. Cuthbertson. (Nottingham and District Technical College, Shakespeare Street, Nottingham, at 7.30 p.m.)

APPOINTMENTS VACANT

APPOINTMENTS VACANT

ALUMINIUM LABORATORIES LIMITED, BANBURY, require a number of graduates and technicians to work on the following problems:—

Development of new alloys including studies of diffusion, constitution, the properties of intermetallic phases, and the influence of these phases on the properties of the aluminium matrix.

Problems of physical metallurgy and in particular recrystallization. This includes the study of the recrystallization of aluminium alloys by means of measuring changes in their damping capacity at elevated temperatures. The development of non-destructive testing methods and in particular the study of the effect of variations in the constitution and structure of aluminium alloys on their physical properties.

The application of the theory of thermal transfer.

Metallurgical problems concerned with the continuous casting of aluminium.

Electrochemical problems relating to metal finishing.

The study of aluminium paste pigment, manufacture and use. This necessitates the study of chemical-physical problems such as the measurement of particle size, surface tension, and viscosity and the properties of surface films.

Chemical and engineering problems concerned with metal-working lubricants and with the development of analytical methods.

Fundamental engineering aspects of metal-working in fabrication and use.

Study of mechanical properties, including fatigue and creep.

The development of the aluminium can for packing food and other commodities.

The development of structural design methods for engineers using aluminium.

The work is interesting and progressive, and provides unusual opportunities for men with initiative and enthusiasm to perform original research, which may be suitable for publication. The laboratories are situated in pleasant country surroundings and have recently been extended. The salaries will be attractive and in accordance with age and experience. A pension scheme is in operation. Applications should be addressed to: The Director of Research, Aluminium Laboratories Limited, Banbury, Oxon.

DESIGN ENGINEERS. Young, well-qualified engineers, seeking a post giving scope for original thought and providing opportunities for service abroad, are invited to write for further particulars to the Personnel Manager, Imperial Smelting Corporation, Ltd., Avonmouth, Bristol. Applicants must possess a university degree, preferably with honours, and have had some postgraduate experience in chemical or heavy engineering. Practical experience, however, is considered less important than the ability to apply theoretical principles to the practical problems encountered in work of a pioneer nature. When writing please quote reference ISO/IM.

ENGLISH ELECTRIC CO., LTD. ATOMIC POWER

A university graduate in metallurgy is required to form a section of a laboratory to deal with welding problems and the development of new welding techniques. Many of the problems will be concerned with the joining of materials used in nuclear reactors. Some experience in the field of welding is desirable. Vacancies also exist now for young metallurgists in new laboratories engaged on problems associated with materials required in the construction of nuclear reactors. Applicants should write to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. No. 1367F.

G.K.N. GROUP RESEARCH LABORATORY requires a **METALLURGIST** to carry out work in the field of Titanium and its alloys. Candidates must have 1st or 2nd class Honours Degree in Metallurgy and at least 2 years' postgraduate experience. Applications in writing, giving full details of qualifications and experience, should be addressed to: The Director of Research, G.K.N. Group Research Laboratory, Birmingham New Road, Lanesfield, Wolverhampton. All communications to carry reference No. MT.1.

GUEST, KEEN AND NETTLEFOLDS Group Research Laboratory requires a **PHYSICAL CHEMIST** or **METALLURGIST** for work on gas-metal reactions occurring during the annealing of silicon-iron alloys. The candidate should have a good degree or equivalent qualification. Some knowledge of the thermodynamics of chemical reactions is essential, and 2-3 years' experience of working in a similar field

would be an advantage. Applications, giving full details of qualifications and experience, to the Director of Research, G.K.N. Group Research Laboratory, Birmingham New Road, Lanesfield, Wolverhampton. All communications to carry reference number MP.1.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, Billingham Division, require an experienced Metallurgist for work in the Division Metallurgical Laboratories. The work is varied and deals with the wide range of metallic materials and fabrication processes used in the erection and maintenance of many chemical processes.

The man appointed will be required to assist in the diagnosis of equipment failures and will be expected to undertake original research work; encouragement is given for publication of papers based on such work.

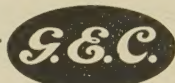
The Division's metallurgists are in regular contact with Research Associations and other industrial laboratories; they also maintain contact with contractors engaged in work for the Division.

Candidates should be in the age group of 30-35, and should have a good degree in metallurgy and several years' experience in industry, preferably in a branch of the metal or equipment producing industries. The appointments are permanent and pensionable. Attractive salaries are offered and assistance can be given towards house purchase.

Write, giving full details of age, qualifications, and experience to the Staff Manager, Imperial Chemical Industries, Limited, Billingham, Co. Durham, quoting reference T.4.

METALLURGIST (age 21-28) completed National Service, required to undertake wide variety of ferrous and non-ferrous work in connection with research on machining and cold forming of metals. Modern equipment. The position is permanent and there are good opportunities for advancement. Pension scheme. Full details, including age, experience, qualifications, and present salary, to Secretary, Production Engineering Research Association, Melton Mowbray.

METALLURGISTS. Vacancies exist in Research Laboratories of Aircraft company for Metallurgists who are of degree standard and who have industrial experience in Foundry Technology, Heat-Treatment, Strength of Materials, Metallography, or Physical Testing. Prospects in these positions are good, and applicants should send particulars to Box M F 396, A.K. Adv. 212a, Shaftesbury Avenue, London, W.C.2.



METALLURGICAL RESEARCH

The Research Laboratories of The General Electric Co. Ltd., East Lane, North Wembley, Middlesex, are seeking first class Physicists, Physical Chemists and Metallurgists, for an expanding programme of Metallurgical Research in many fields including Atomic Energy.

One senior appointment might be made for which candidates should show evidence of considerable research ability and experience. They would be expected to show the scientific leadership necessary for a post of high responsibility.

Apply in writing to the Staff Manager (Ref. RLO/70), giving full particulars of experience, qualifications and age.

APPOINTMENTS VACANT

METALLURGISTS or METALLURGICAL CHEMISTS, B.Sc. or equivalent, required for Tin Smelting Works in Singapore and Malaya. Applicants should be not older than 30 years, and preference will be given to single men. First-class passage and free furnished quarters provided. Provident Fund. Salary according to qualifications and experience, but not less than £1200 p.a. Apply, giving full details of age, qualifications, and experience, &c., to Box No. 402, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

METALLURGISTS required for control and development of Works' processes, including casting, rolling, extruding, heat-treatment, of aluminium and aluminium alloys. Applicants should not be over 30 years of age, and must be graduates in metallurgy, or expect to graduate in 1956. Please write, giving full details career, and salary expected, to Personnel Manager, Northern Aluminium Co., Ltd., Banbury.

MINISTRY OF SUPPLY, Royal Aircraft Establishment, Farnborough, Hants., require **SENIOR METALLURGIST** for metallurgical investigations of failures and defects in aircraft parts; also to take part in metallurgical research of the department. *Qualifications*:—1st or 2nd class Honours degree in Metallurgy or equivalent qualification. Previous experience of failure investigations desirable; good knowledge of metallography essential; at least 3 years' post-graduate research experience required. Appointment according to age, experience, &c., as **PRINCIPAL SCIENTIFIC OFFICER** (min. age 31) or **SENIOR SCIENTIFIC OFFICER** (min. age 26). Salary range P.S.C. £1185-£1567: S.S.O. £1030-£1185 (Superannuable). Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting F.12/6A/NE.

SENIOR ANALYST required to take charge of the Analytical Section of the Central Metallurgical Laboratories of a large Engineering Works in the East Midlands. Applicants should have completed National Service and have experience in the application of the latest techniques of analysis to the wide range of materials usually encountered in an Engineering Works, including ferrous and non-ferrous metals, solid, liquid, and gaseous fuels, ashes and deposits, &c. Post pensionable. 5-day week. Applications, stating age, qualifications, and experience, to Box No. 404, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

SENIOR METALLURGIST required by THE ENGLISH ELECTRIC Co., LTD., at LUTON for assistance to Designers in the development of Guided Weapons. Experience in the aircraft industry, or the manufacture of component parts in both aluminium and ferrous alloys, is desirable. The work involves a wide knowledge of metals, their application, and methods of fabrication and protection. Salary commensurate with qualifications and experience. Applications in strict confidence to Dept. C.P.S. 336/7, Strand, W.C.2, quoting Ref. 1112D.

THE IRON AND STEEL INSTITUTE requires assistant (age about 30-40 years) to supervise preparation of and to edit abstracts. Knowledge of manufacture and properties of iron and steel necessary, foreign languages useful. Five-day week. Write, stating age, experience, and salary required to Secretary, The Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1.

YOUNG METALLURGICAL GRADUATE (or equivalent) required in the Research Department of HADFIELDS, LTD. The post, which is a progressive one, involves interesting duties in connection with metallurgical control in the production of high-quality Steel Castings and Forgings, &c. Some experience of Steel Works Processes desirable, but not essential. Excellent working conditions, staff dining and welfare facilities. Applications with details of qualifications and experience, stating age and salary required, should be addressed to The Personnel Manager, Hadfields Ltd., East Hecla Works, Vulcan Road, Sheffield 9.



Research Laboratories

NORTH WEMBLEY, MIDDLESEX



GRADUATES

of outstanding and proven ability in research in **PHYSICS, ENGINEERING, CHEMISTRY and METALLURGY**, are required to strengthen the research staff of **THE GENERAL ELECTRIC COMPANY**.

The Research Laboratories at Wembley are in pleasant surroundings yet convenient to the scientific and cultural amenities of London. The range of work and choice of subjects is wide. Scientific publication is encouraged.

The openings provide excellent opportunities for continuing contact with the academic schools of the country while working in association with a progressive manufacturing industry. Salaries offered will be commensurate with the expected standard of ability.



Anyone having the necessary high qualifications who is interested in exploring the opportunities presented by these appointments, is invited to apply to the Staff Manager (Ref. RLO/64), Research Laboratories, The General Electric Co. Ltd., East Lane, North Wembley, Middlesex.

METALLURGICAL TRANSLATIONS from French, German, and Italian undertaken by experienced translator. 35s. per 1000 words. References supplied. Mrs. L. F. Secretan, M.A., 8 Cambridge Road, Wimbledon, London, S.W. 20.

EDITORIAL ASSISTANT

An editorial assistant is required for the publications of the Institute of Metals. A qualification in metallurgy, physics, or chemistry and an aptitude for writing are essential; a knowledge of languages is desirable. The post is permanent and pensionable.

Apply, stating experience and salary required, to the Editor, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

Price List of Publications

Note.—Prices quoted in dollars, for the convenience of American and Canadian purchasers, include an allowance for charges for collection of cheques. Customers' cheques on their American or Canadian banks will be accepted.

TITLES AND AUTHORS	Published Price		Price to Members		Booksellers' and	
	Post Free		(one copy each) Post Free		Library Rate Post Free	
	£	s. d.	\$	£	s. d.	\$
<i>Monthly</i>						
JOURNAL OF THE INSTITUTE OF METALS WITH THE BULLETIN AND METALLURGICAL ABSTRACTS. 12 monthly issues plus proceedings and index issue and binding cases	9	0 0	25.65	4 10 0	13.00	7 10 0 21.45
<i>Cloth-Bound</i>						
JOURNAL OF THE INSTITUTE OF METALS						
Volumes 1-65 (1909-1939), per vol.	1	10 0	4.50	15 0	2.50	1 5 0 3.75
Volumes 66-83 (1940-1954/5), per vol.	3	0 0	9.00	1 10 0	4.50	2 10 0 7.50
Volume 84 (1955/6), per vol. onwards	4	10 0	13.00	2 5 0	6.75	3 15 0 11.00
<i>(Note.</i> —The General Indexes to the "Journal", Vols. 1-25 and 26-63 are out of print.)						
METALLURGICAL ABSTRACTS (New Series), Annual						
Volumes 1-22 (1934-1954/5), per vol.	3	0 0	9.00	1 10 0	4.50	2 10 0 7.50
Volumes 23 (1955/6), per vol. onwards	4	10 0	13.00	2 5 0	6.75	3 15 0 11.00
<i>(Important Note.</i> —Vols. 7-10, inclusive (1940-1943), can only be supplied in a set of Vols. 1-10, with General Index; and Vol. 12 (1945) can only be supplied in a set of Vols. 11-20 (1944-1953).)						
GENERAL INDEX TO METALLURGICAL ABSTRACTS. Volumes 1-10 (1934-1943)						
In 2 volumes, per set	5	5 0	15.15	4 4 0	12.20	4 7 6 12.70
<i>MONOGRAPH AND REPORT SERIES (Cloth-Bound)</i>						
No. 1.—THE STRUCTURE OF METALS AND ALLOYS. By W. Hume-Rothery and G. V. Raynor. Third edition, greatly enlarged (1954)	1	15 0	5.50	17 6	3.00	1 9 2 4.50
No. 2.—THE CONSTITUTIONAL DIAGRAMS OF ALLOYS: A BIBLIOGRAPHY. By J. L. Haughton. Second edition by A. Prince (1956)	1	15 0	5.50	17 6	3.00	1 9 2 4.50
No. 3.—ATOMIC THEORY FOR STUDENTS OF METALLURGY. By W. Hume-Rothery. Second edition, revised (1955)	1	10 0	4.50	15 0	2.50	1 5 0 3.75
No. 4.—AN INTRODUCTION TO THE ELECTRON THEORY OF METALS. By G. V. Raynor. Third printing (1953)	10	6	2.00	5 3	1.15	8 9 1.65
No. 7.—THE SOLIDIFICATION OF CASTINGS: A REVIEW OF THE LITERATURE. By R. W. Ruddle. <i>(Second edition in preparation)</i> . . . . .	...	...	...	...	...	...
No. 10.—THE NON-DESTRUCTIVE TESTING OF METALS. By R. F. Hanstock (1951)	1	1 0	3.50	10 6	2.00	17 6 2.90
No. 11.—THERMODYNAMICS OF ALLOYS. By J. Lumsden (1952)	1	15 0	5.50	17 6	3.00	1 9 2 4.50
No. 13.—PROPERTIES OF METALLIC SURFACES (1953)	1	15 0	5.50	17 6	3.00	1 9 2 4.50
No. 14.—EQUIPMENT FOR THE THERMAL TREATMENT OF NON-FERROUS METALS AND ALLOYS (1953)	15	0	2.50	7 6	1.50	12 6 1.95
No. 15.—THE CONTROL OF QUALITY IN THE PRODUCTION OF WROUGHT NON-FERROUS METALS AND ALLOYS. VOL. I.—THE CONTROL OF QUALITY IN MELTING AND CASTING (1953)	15	0	2.50	7 6	1.50	12 6 1.95
No. 16.—THE CONTROL OF QUALITY IN THE PRODUCTION OF WROUGHT NON-FERROUS METALS AND ALLOYS. VOL. II.—THE CONTROL OF QUALITY IN WORKING OPERATIONS (1954)	15	0	2.50	7 6	1.50	12 6 1.95
No. 17.—THE CONTROL OF QUALITY IN THE PRODUCTION OF WROUGHT NON-FERROUS METALS AND ALLOYS. VOL. III.—THE CONTROL OF QUALITY IN HEAT-TREATMENT AND FINAL OPERATIONS (1955)	15	0	2.50	7 6	1.50	12 6 1.95
No. 18.—THE MECHANISM OF PHASE TRANSFORMATIONS IN METALS <i>(in the press)</i> . . . . .	...	...	...	...	...	...
No. 19.—THE RUNNING AND GATING OF SAND CASTINGS: A REVIEW OF THE LITERATURE. By R. W. Ruddle <i>(in the press)</i>	1	5 0	4.00	12 6	2.20	18 10 3.10
<i>(Note.</i> —Monographs Nos. 5, 6, 8, 9 and 12 are now out of print.)						
<i>ANNOTATED EQUILIBRIUM DIAGRAMS</i>						
No. 1—Al-Zn; No. 2—Cu-Sn; No. 3—Cu-Zn; No. 4—Al-Cu; No. 5—Al-Mg; No. 6—Pb-Sn; No. 7—Be-Cu; No. 8—Fe-Zn; No. 9—Sb-Pb; No. 10—Cu-Ag; No. 11—Fe-Ni; No. 12—Cd-Zn; No. 13—Al-Fe; No. 14—Al-Sn; No. 15—Al-Sb; No. 16—Al-Si; No. 17—Al-Mn; No. 18—Al-Ni; No. 19—Al-Be; No. 20—Al-Co; No. 21—Al-Ag; No. 22—Al-Ti, each	2	0	0.50	1 0	0.40	1 8 0.40

DISCOUNT FOR SERIES

A discount of 10% on the prices of the *Journal* or *Metallurgical Abstracts* will be allowed on all orders of 10 volumes or more (including index volumes), and a discount of 25% will be allowed for complete sets.